Musculoskeletal, Oral and Skin Sciences IRG

Overall Description:

The Musculoskeletal, Oral and Skin Sciences (MOSS) IRG will consider research applications that address structural systems that are prerequisite for physical form, mechanical function, movement, and integrity of the body. These structural systems and their components are the basis for the organization of the study sections of this IRG and are described according to the following topical areas: skeleton, spine, bone, connective tissue, extracellular matrix, and their related diseases/disorders; dental/oral and craniofacial and their related diseases/disorders; skeletal muscle, limb, and their related diseases/disorders; joints and their related diseases/disorders, including rheumatic diseases; skin and its related diseases/disorders. Autoimmune diseases are specifically included. For these topical areas, the studies considered range from molecular genetics and stem cell research to animal models and clinical trials. For each major topical area, the research applications may include studies of: basic biology, including growth, development, maturation, and aging; biomaterials for prostheses/orthotics and implants; pathogenesis and therapeutics; physical rehabilitation; exercise; mechanobiology/biomechanics; injury and repair, including adaptation, plasticity, degeneration, and regeneration; diagnostic markers and biomarkers; cell and gene-based therapies; and clinical outcomes and trials.

The following study sections are included within the MOSS IRG:

- Oral, Dental and Craniofacial Sciences (ODCS)
- Skeletal Biology Development and Disease (SBDD)
- Skeletal Biology Structure and Regeneration (SBSR)
- Skeletal Muscle Biology and Exercise Physiology (SMEP)
- Musculoskeletal Rehabilitation Sciences (MRS)
- Arthritis, Connective Tissue, and Skin (ACTS)

The study sections that compose the MOSS IRG are amongst the first to be proposed for re-organization and implementation. As a result, some of the Teams that will develop recommendations for other IRGs that may share interests in areas of research with the MOSS IRG have not yet met or completed their deliberations. Therefore, the proposed “shared interest” guidelines for each of the study sections listed below are tentative, pending further input from the remaining study section design Teams, the community, and the CSR Advisory Committee to the Director, CSR

Oral, Dental and Craniofacial Sciences (ODCS) Study Section

The Oral, Dental and Craniofacial Sciences (ODCS) study section reviews applications involving basic, applied and clinical aspects of the development, biology, pathology and repair of oral, dental and craniofacial tissues.

Specific Areas Covered by ODCS include:

- Biochemistry, molecular and cell biology of oral and craniofacial structures: tissue organization and structure, including cell-extracellular matrix and cell-cell interactions in dentin, cementum, enamel and craniofacial and alveolar bone; associated diseases and disorders of these structures; salivary gland and oral mucosa; TMJ-associated structures, including ligaments and muscles, and their associated diseases and disorders.

- Development and patterning of craniofacial, oral and dental structures, including: genetics and gene discovery; normal development and patterning of pharyngeal and musculoskeletal structures of the head and face; patterning of the dentition; formation of periodontal tissues and attachment complex; and developmental anomalies of these craniofacial, oral and dental structures.

- Function and physiology of salivary gland and the oral mucosal environment: salivary secretions and crevicular fluids; salivary proteins, saliva chemistry and diagnostics; salivary gland pathology, including Sjogren's syndrome; and radiation- and systemic disease-induced xerostomia.

- Oral bacterial pathogenesis, including oral microbiological infections; study of the role of inflammation and the immune system in oral diseases processes and prevention, etiology and agents involved in caries, periodontal diseases; other oral and hard tissue infections; biofilms of oral tissues; and systemic consequences of oral microbial infections.

- Biomimetics and bioengineering of dental and craniofacial tissues: biomimetic approaches for repair and replacement of dental and craniofacial tissues and associated structures, including the TMJ, salivary gland and masticatory musculature; dental restorative materials; biomechanics at micro- and macro levels; bioengineering, including cell- and gene-based therapy, drug delivery, reconstruction and repair of the oral tissues, craniofacial skeleton, and TMJ; reconstruction and regeneration of the salivary gland; salivary gland as a vehicle for oral and systemic gene therapy; biosensors; and structural and diagnostic imaging.

Shared Interests Within the IRG:

- Arthritis, Connective Tissue and Skin (ACTS) and Skeletal Muscle Biology and Exercise Physiology (SMEP) study sections: A) If the primary focus of an application is on TMJ and associated local musculature, rather than on systemic disease, assignment may be to the Oral, Dental and Craniofacial Sciences (ODCS); B) If the focus is on salivary gland, rather than on other systems, assignment could be assigned to the Oral, Dental and Craniofacial Sciences (ODCS).

- Skeletal Biology Development and Disease (SBDD): Applications studying bone biology in craniofacial mineralized tissues, including craniofacial, intramembranous and alveolar bone may be assigned to the Oral, Dental and Craniofacial Sciences (ODCS), Skeletal Biology Development and Disease (SBDD) or Skeletal Biology Structure and Regeneration (SBSR) depending on the central focus of the application. Applications focused on cementum, dentin

and enamel may be assigned to Oral, Dental and Craniofacial Sciences (ODCS). Studies of biomineralization of bone, dentin, cartilage and other tissues may be consolidated in Skeletal Biology Development and Disease (SBDD).

Shared Interests Outside the IRG:

- Biology of Development and Aging (BDA) IRG: In general, applications that focus on early development (such as cell cycle control, apoptosis, cell fate, or early pattern formation) would be assigned to the BDA IRG. Similarly, when the question being addressed is germane to the development of more than a single organ system, either because it addresses the "primordial organ" or because of the generality of the process being studied, the application would be assigned to the BDA IRG. Studies focused on development of a specific organ or tissue would be reviewed in the context of that organ system. In the case of craniofacial, oral and dental structures assignment would be to Oral, Dental and Craniofacial Sciences (ODCS). Assignment should be made based on the central focus of the application.

- Bioengineering Sciences and Technologies (BST) IRG: Grant applications focused on dental and craniofacial tissue mechanisms and therapies and the application of medical implant materials, may be assigned to ODCS. Grant applications focused on developing technologies to introduce genes and drugs in a general cellular context are relevant to BST IRG. Applications on general biocompatibility and new material development could be assigned to the BST IRG or SBIB IRG.

- Health of the Population (HOP) IRG and Risk, Prevention, and Health Behavior (RPHB) IRG: Behavior modification directed toward the prevention and treatment of oral or dental health could be assigned to the HOP IRG and RPHB IRG. Applications in which the primary outcome is evaluation of behavior are also appropriate for the HOP IRG and RPHD IRG. Population studies related to demographics or large scale interventions may generally be assigned to HOP IRG. Applications on the diseases or functional consequences of behaviors could be assigned to ODCS.

- Immunology (IMM) IRG: IMM IRG may be assigned applications concerning the etiology and pathogenesis of organ-specific and systemic autoimmune diseases. ODCS may be assigned applications on inflammatory and degenerative diseases of oral soft and hard tissues. ODCS is complementary to IMM IRG with respect to those applications requiring expertise in pathogenic effector mechanisms and specific factors or structures relevant to target organ damage and repair. Similarly, IMM IRG is complementary to ODCS with respect to those applications requiring expertise in immunopathogenic mechanisms.

- Infectious Diseases and Microbiology (IDM) IRG: Oral microbiology applications may be assigned to ODCS. IDM IRG may be assigned applications where the focus is on the bacteria per se rather than the oral hard and soft tissues. This may include colonization and mechanisms of pathogenesis, but the two IRGS complement each other in these areas.

- AIDS and AIDS-Related Research (AARR) IRG: Studies of oral manifestations of HIV and AIDS should be assigned to AARR IRG.

- Oncological Sciences (ONC) IRG: Applications focused on head, neck or oral cancers may be assigned to ONC IRG. Studies on pre-neoplatic, dysplastic and hyperplastic lesions and disorders may be assigned to ODCS.

- Endocrinology, Metabolism, Nutrition, and Reproductive Sciences (EMNR) IRG: Applications that focus upon nutrients, or general nutrition, may be assigned to EMNR IRG. The effects of nutrients and other food components where oral or dental disease may be a part of the study could be assigned to EMNR IRG. Basic, translational or clinical applications with a primary focus on oral and dental disease, where nutrients or general nutrition may be a part of the study may be assigned to ODCS.

- Surgical Sciences, Biomedical Imaging, and Bioengineering (SBIB) IRG: Grant applications focused on dental and craniofacial tissue mechanisms, medical implant materials and devices, or imaging may be assigned to ODCS. Applications on general biocompatibility and new material development could be assigned to either the BST IRG or SBIB IRG.

Skeletal Biology Development and Disease (SBDD) Study Section

The Skeletal Biology Development and Disease (SBDD) study section reviews grant applications that deal with the basic and translational aspects of the cells and matrix and their organization in skeletal tissues, including bone, cartilage, and other connective tissues, with a focus on cellular and molecular biology, biochemistry, physiology, development, biomineralization, aging, heritable and metabolic bone diseases, pathogenesis, and hormonal and paracrine functions.

Specific Areas Covered by SBDD:

- Molecular and cellular biological and biochemical aspects of osteoblasts, chondrocytes, connective tissue cells, osteoclasts and other cells in the marrow environment in both normal and pathological conditions; studies of calcitropic hormones and paracrine factors involved in the biology of these cells; physical and mechanical influences on cellular behavior; role of bone in mineral ion homeostasis.

- Mechanisms of skeletal patterning; biology of mesenchymal progenitor cells and their differentiation; regulation of osteoclast lineage; cellular proliferation, lineage commitment, differentiation, apoptosis and their abnormalities; cellular aspects of aging of the skeleton.

- Structural and organizational aspects of bone and cartilage: cortical vs. trabecular bone; interactions between musculoskeletal elements; remodeling of the skeleton.

- Extracellular matrix: biomineralization of the extracellular matrix of skeletal and connective tissues and its regulation; structure and organization of matrix components; cell matrix interaction and signaling.

- Genetic linkage studies, gene discovery, gene expression in animal models and humans; models for gene therapy.

- Studies of molecular pathogenesis and biology of bone disease, in vitro studies and animal models of the effects of primary tumors and metastasis to bone on function.

- Diseases of the skeleton and mineral metabolism in humans and animal models: biomarkers, natural history, imaging and therapeutics as they apply to clinical and basic studies of osteoporosis, osteomalacia and other metabolic bone diseases; osteogenesis imperfecta; Paget's disease of bone; chondrodystrophies, osteodystrophies; diseases of mineral ion homeostasis associated with abnormalities of parathyroid hormone, Vitamin D, calcitonin and other hormonal and paracrine factors.

Shared Interests Within the IRG:

- Arthritis, Connective Tissue, and Skin (ACTS): Changes in extracellular matrix that occur in arthridites, skin, and skeletal muscle disease. In general, applications that focus on abnormalities of matrix limited to bone and cartilage and associated tendon and ligament structures would be assigned to the SBDD.

- Skeletal Biology Structure and Regeneration (SBSR): The study of skeletal cell biology is shared with SBSR. The focus of SBSR is primarily injury and repair while that of SBDD is on basic and translational studies.

- Oral, Dental and Craniofacial Sciences (ODCS): Studies of bone and cartilage biology in craniofacial structures may be assigned to either ODCS or SBDD. In general, studies of biomineralization would be consolidated in SBDD with other skeletal studies of this topic.

Shared Interests Outside the IRG:

- Genes, Genomes and Genetics (GGG) IRG: Studies of the genetic analyses of skeletal diseases could be assigned to SBDD. Studies of quantitative genetics, genetic epidemiology and genetic analysis of complex traits, and genetically engineered animals with an emphasis on systems physiology rather than skeletal diseases may be assigned to the GGG IRG.

- Biology of Development and Aging (BDA): Studies of early developmental biology may be assigned to BDA IRG. When the focus is on lineages committed to formation of skeletal elements, assignment could be to SBDD. When osteoporosis is a secondary aspect of a multi-system study of the aging process, assignment could be appropriate for BDA IRG; when osteoporosis is the primary study focus, the assignment may be to SBDD.

- Bioengineering Sciences and Technologies (BST) IRG: Grant applications focused on biomineralization and the application of medical implant materials, may be assigned to SBDD. Applications on general biocompatibility and new material development could be assigned to BST IRG . Grant applications focused on developing technologies to introduce genes and drugs in a general cellular context are relevant to BST IRG.

- Health of the Population (HOP) IRG: In general, studies of the epidemiology of osteoporosis and other bone diseases would be assigned to HOP IRG study sections as appropriate.

- Oncological Sciences (ONC) IRG: In general, studies of bone tumors would be assigned to ONC IRG. In general, when interactions between the bone/marrow microenvironment and metastatic cells are crucial to the function of the musculoskeletal system assignment would be to SBDD or SBSR.

- Endocrinology, Metabolism, and Reproductive Sciences (EMNR) IRG: (1) There are shared interests in the areas related to remodeling and pelvic floor support. Applications whose endpoints are remodeling of reproductive tissues may be assigned to EMNR IRG. On the other hand, basic or translational studies evaluating alterations in the supporting pelvic floor musculoskeletal structures could be assigned to SBDD. (2) Applications that focus upon nutrients, or general nutrition, may be assigned to EMNR IRG. The effects of nutrients and other food components where bone disease may a part of the study may be assigned to EMNR IRG. Basic or translational applications with a primary focus on bone disease, where nutrients or general nutrition may be a part of the study may be assigned to SBDD.

Skeletal Biology Structure and Regeneration (SBSR) Study Section

The Skeletal Biology Structure and Regeneration (SBSR) study section reviews applications involving both basic and applied aspects of the musculoskeletal system, with a focus on bone, cartilage, ligament, and tendon at the tissue and organ level; their interaction in joints, including those in the spine; their development; their response to normal loading, injury, aging, and disease and disorders; as well as their regeneration and repair, all using cell, tissue, and animal models and human subjects.

Specific Areas Covered by SBSR:

- Molecular and cell biology of bone, cartilage, tendon, and ligament injury and repair.

- Gene expression, gene regulation, and gene therapy in the processes of injury and repair of musculoskeletal tissues.

- Mechanobiology and biomedical mechanics at the molecular, cellular, tissue, and organ level.

- Understanding of the nature of injuries, disorders, and diseases involving the musculoskeletal system of developmental, infectious, degenerative, traumatic, and age-related etiologies. This includes sports-related and repetitive motion disorders and the wear, injury-induced, and degenerative changes manifest in articular and meniscal cartilage.

- Characterization of the intrinsic capacity of musculoskeletal tissues and joints to repair and regenerate, as well as the development and application of strategies to enhance repair, including the use of biomolecular (eg. cytokines, growth, and differentiation factors), biomaterials, mechanical and cellular approaches (tissue engineering), limb lengthening techniques, and targeted physical rehabilitation programs.

- Joint mechanics (including forces and kinematics) and joint replacement (including design, materials, fixation, wear, and other modes of failure.

Shared Interests Within the IRG:

- Arthritis, Connective Tissue, and Skin (ACTS): Changes in articular cartilage (cells, matrix, and architecture) occur in the inflammatory arthridites (e.g. rheumatoid arthritis) as well as osteoarthritis. ACTS could review studies of arthritis focusing on systemic inflammatory processes. Studies of cartilage degeneration and associated changes in bone and joints following joint injury and instability, or developmental disorders (e.g. DDH), as well as the study of articular cartilage in normal growth and development could be assigned to SBSR. Studies of injuries and their treatment for conditions, such as osteochrondritis dissecans and osteoarticular fractures, may be assigned to SBSR.

- Musculoskeletal Rehabilitation Sciences (MRS): SBSR may review physical rehabilitation programs that relate directly to the success of treatment strategies associated with injuries or post-operative conditions of isolated musculoskeletal conditions. Studies dealing with more systemic or multisystems disorders and/or degenerative states could be considered for review by MRS.

- Skeletal Biology Development and Disease (SBDD): Given the close link between bone research, basic and applied, there will be shared interests regarding applications that take a broad approach to musculoskeletal tissues. Studies more appropriate for SBSR will have greater emphasis on the repair of bone, connective tissue, tendons/ligaments, and subsequent function of these tissues.

Shared Interests Outside the IRG:

- Behavioral and Biobehavioral Processes (BBP) IRG and Integrative, Functional, and Cognitive Neuroscience (IFCN) IRG: Nerve injury and repair related to targeted musculoskeletal conditions constitute shared interests with BBP IRG and IFCN IRG, but may be included in SBSR.

- Oncological Sciences (ONC) IRG: Studies of musculoskeletal oncology may be assigned to SBSR when the emphasis of the study is on the function of the musculoskeletal system or elucidation of the nature of growth, development, aging, or other disease of skeletal tissues. ONC IRG could be assigned other aspects of musculoskeletal oncology.

- Endocrinology, Metabolism, Nutrition, and Reproductive Sciences (EMNR) IRG: (1) There are shared interests in the areas of remodeling and pelvic floor support. Applications whose endpoints are remodeling of reproductive tissues may be assigned to EMNR IRG. On the other hand, studies evaluating alterations in the supporting pelvic floor musculoskeletal structures may be assigned to SBSR. (2) The effects of nutrients and other food components where bone disease may a part of the study may be assigned to EMNR IRG. Applications with a primary focus on bone disease, injury or repair, where nutrients or general nutrition may be a part of the study may be assigned to SBSR.

- Surgical Sciences, Biomedical Imaging, and Bioengineering (SBIB) IRG and Biogengineering Sciences & Technologies (BST) IRG: Studies of the load-bearing requirements of implants intended to replace or reinforce portions of the skeletal system, and studies examining tissue engineering, biomaterials, and implant mechanics specific to the musculoskeletal system could be assigned to SBSR. Studies designed to address more general principles of biomaterial design and development and non-musculoskeletal aspects of tissue engineering and biomechanics may be considered under the auspices of the BST IRG and SBIB IRG.

Skeletal Muscle Biology and Exercise Physiology (SMEP) Study Section

The Skeletal Muscle Biology and Exercise Physiology (SMEP) study section will consider molecular, cellular, physiological and integrative studies of normal and altered skeletal muscle function and processes that range from molecular genetics, to structure-function relationships, to integrative and functional studies on human mobility and exercise, and health. Integrative studies include development and aging, as well as gender and ethnicity differences in muscle function. Therapeutic and preventive interventions as they relate to skeletal muscle function are included. Studies of the biochemistry and molecular biology of skeletal muscle and injuries, and diseases of muscle will be included for review in this study section. The goal is to provide a comprehensive review of skeletal muscle biology and muscle diseases, plasticity in adult skeletal muscle and aging, repair and exercise.

Specific Areas Covered by SMEP:

- Studies of skeletal muscle proteins:
    - Biochemical and molecular biological research on skeletal muscle-specific proteins, including, but not limited to actin, myosin, titin, dystrophin, sarcoglycans, sarcoendoplasmic reticulum calcium ATPase acetylcholine receptor, ion channels, membrane cytoskeletal proteins,

basement membrane proteins, growth factor and hormone receptors, nuclear and sarcolemmal receptors, and anchor proteins

- Studies of skeletal muscle cells:
  - Research on excitability, excitation-contraction coupling, and calcium regulation.
  - Molecular studies of force generation, mechanics of force generation in muscle fibers, and transmission force to tendon and bone.
  - Cell-cell and cell-matrix interactions.
  - Signal transduction pathways in normal and altered states.
  - Physiological evaluation of skeletal muscle gene function.
  - Stem and satellite cell biology.
  - Regulation of skeletal muscle energy and substrate metabolism and control of individual processes and networks, including mitochondrial.

- Studies of skeletal muscle as a tissue:
  - Molecular and cellular mechanisms of skeletal muscle adaptation, growth, injury, repair, degeneration, and regeneration; effects of atrophy, exercise and inactivity, maturation, nutrition, and the aging process on skeletal muscle function, protein turnover, and metabolism; normal and abnormal neural control of muscle fiber type and molecular phenotype.
  - Imaging of skeletal muscle properties, metabolism, and mechanical dynamics - for example PET, MRS, MRI, and ultrasound.
  - Skeletal muscle biology of sarcopenia.

- Integrative functions:
  - Use of exercise in treatment and prevention of aging and/or diseases related to skeletal muscle wasting and maintenance of functional capacity; role of exercise training in the enhancement of physical performance in athletes and as a therapy.
  - Muscle metabolism and metabolic interactions with other systems in so far as they influence skeletal muscle function and disease.
  - Physiologic interactions between skeletal muscle and other systems and disease when skeletal muscle function is the primary focus; studies of skeletal muscle cell and organ properties that influence the output of the nervous system.
  - Mechanisms involved in alterations of skeletal muscle function and capacity due to systemic diseases or to their treatments, such as Type II diabetes and congestive heart failure; glucose transport in skeletal muscle and responses to exercise.

- Skeletal muscle diseases:
  - Evaluation of gene function, and development of genetic models; mapping, cloning, and mutation/SNP analysis of normal and altered genes in skeletal muscle function.
  - Pathophysiology of skeletal muscle disorders and diseases, including the muscular dystrophies, atrophy, myotonia, periodic paralysis, malignant hyperthermia, and inflammatory myopathies; inflammatory processes of skeletal muscle, as a primary disease process or as secondary. manifestation; pharmacological interventions and pre-clinical approaches

- Cell and gene therapies for skeletal muscle diseases.

Shared Interests Within the IRG:

- Arthritis, Connective Tissue and Skin (ACTS): Studies in inflammatory myopathies (e.g., polymyositis, dermatomyositis) represent a shared interest of SMEP and ACTS. Proposals could be reviewed in either study section. Those focused more on systemic disease and autoimmune aspects may be appropriate for ACTS. Those focused more on skeletal muscle involvement of inflammatory muscle disease may be more appropriate for SMEP.

- Oral, Dental and Craniofacial Sciences (ODCS): The complex interactions of TMJ disease should be reviewed in the ODCS. Studies involving craniofacial muscles aimed at examining basic aspects of muscle function may be referred to SMEP.

- Musculoskeletal Rehabilitation Sciences (MRS): Studies on exercise and inactivity that focus on skeletal muscle growth and regeneration, contractile activity, or metabolism could be assigned to SMEP. Studies on the use of exercise in rehabilitation, or that are concerned with multiple aspects of the musculoskeleton, may be assigned to MRS.

Shared Interests Outside the IRG:

- Biological Chemistry and Macromolecular Biophysics (BCMB) IRG and Molecular Approaches to Cell Function and Gene Interactions (MACFI) IRG: Studies designed to address general principles of protein or membrane structure, or cell function, and that use skeletal muscle elements primarily as a convenient source of material, may be considered under the BCMB and MACFI IRGs. In general, studies of muscle structure and function that use primarily biophysical techniques (e.g., X-ray diffraction, electron microscopy/image reconstruction, electron spin resonance, and single molecular techniques) would be assigned to the BCMB IRG.

- Genes, Genomes and Genetics (GGG) IRG: Studies of quantitative genetics, genetic epidemiology and genetic analysis of complex traits, and genetically engineered animals with an emphasis on systems physiology rather than integrated muscle function may be assigned to the GGG IRG.

- Biology of Development and Aging (BDA) IRG: Studies on sarcopenia, age-related decreases in skeletal muscle mass, strength and quality, when the focus is on muscle function, regeneration, contractile activity, or metabolism, could be assigned SMEP. Studies on skeletal muscle that are testing hypotheses about mechanisms of aging that affect multiple systems or non-muscle tissues could be assigned to BDA IRG (e.g., hypotheses on mechanisms of extension of lifespan by caloric restriction). Studies on skeletal muscle mass or properties that are part of studies of multiple age-related changes in physiology or body composition (e.g. fat, cardiovascular and bone) could be assigned to BDA IRG. Studies examining early events in development, even if they are relevant to skeletal

muscle may be assigned to BDA IRG. Other overlapping interests may include regulation of the cell cycle, apoptosis, and skeletal muscle cell senescence.

- Bioengineering Sciences and Technologies (BST) IRG: Studies of the use of skeletal muscle as a platform for gene delivery for non-muscle diseases, such as for vaccine development, may be assigned to BST IRG. Application of gene delivery technologies when it is specific for skeletal muscle and skeletal muscle diseases may be more appropriate for SMEP. Development of novel technologies may be assigned to BST IRG.

- Health of the Population (HOP) IRG and Risk, Prevention, and Health Behavior (RPHB) IRG: Behavior modification directed toward the prevention and treatment of skeletal muscle disorders could be assigned to the HOP IRG and RPHB IRG. Applications in which the primary outcome is evaluation of behavior are also appropriate for the HOP IRG. Population studies related to demographics may generally be assigned to the HOP IRG. Applications on the diseases, disorders, or functional consequences of behaviors could be assigned to SMEP.

- Cardiovascular Sciences (CVS) IRG: SMEP and CVS IRG have complementary roles and mutual interests in two areas of research. (1) In general, the influence of exercise on the cardiovascular system would be assigned to CVS IRG. Similar studies where the focus is on the musculoskeletal system could be assigned to SMEP. Studies that focus on blood flow in skeletal muscle in response to exercise would be assigned on the basis of the central interests of the application. (2) In order to cluster appropriate expertise, studies of cardiomyopathy in muscular dystrophies would be assigned to SMEP.

- Endocrinology, Metabolism, Nutrition, and Reproductive Sciences (EMNR) IRG: (1) Applications dealing with exercise may be an area of shared interest with the EMNR IRG. If the application primarily deals with the effects of exercise on the treatment, prevention or consequences of obesity and diabetes or insulin action, it could be assigned to the EMNR IRG. Applications dealing primarily with the effects of exercise on skeletal muscle function may be assigned to SMEP. (2) Applications that focus upon nutrients and other food components, or general nutrition, may be assigned to the EMNR IRG. The effects of nutrients and other food components where skeletal muscle may a part of the study may also be assigned to the EMNR IRG. Basic, translational or clinical applications with a primary focus on skeletal muscle health and disease, where nutrients or general nutrition may be a part of the study may be assigned to SMEP. (3) Proposals that focus primarily upon glucose and lipid metabolism, or the effects of obesity, diabetes, or dietary changes on the whole body or multiple organ systems are appropriate for the EMNR IRG. Applications dealing primarily with the effects of exercise, diabetes or nutrition on skeletal muscle mass or metabolism may be assigned to SMEP.

- Respiratory Sciences (RES) IRG: Applications focused upon the mechanical/ventilatory action of the respiratory muscles, including the ventilatory consequences of muscle disease, could be assigned to the RES IRG. Studies involving respiratory muscles aimed at examining basic aspects of muscle

function (such as cell biology, adaptation, muscle fatigue, and the study of muscular dystrophies) may be assigned to SMEP.

- Surgical, Biomedical Imaging, and Bioengineering (SBIB) IRG: Studies of bioengineering and imaging are appropriate for SMEP when they focus on skeletal muscle cell, tissue and organ function and on integrated skeletal muscle function in limb function and physical rehabilitation. Studies on technology development could be assigned to SBIB IRG.

- Molecular, Cellular, and Developmental Neuroscience (MCDN) IRG, Integrative, Functional and Cognitive Neuroscience (IFCN) IRG, and Brain Disorders and Clinical Neuroscience (BDCN) IRG: In studies of motor control, if the primary focus is on neural structure and function, assignment could be to one of the neuroscience IRGs. When the primary focus is on the role of skeletal muscle force production, assignment may be to SMEP.

Musculoskeletal Rehabilitation Sciences (MRS) Study Section

The Musculoskeletal Rehabilitation Sciences (MRS) study section evaluates applications pertaining to the biological mechanisms and therapeutics of impaired physical functioning, as well as exercise and physical manipulation, as rehabilitation strategies as they relate to the musculoskeletal system. The study section reviews both regular research (R01, R21, and R03) applications as well as Small Business and Technology Transfer (SBIR and STTR) applications relevant to the topics covered.

Specific Areas Covered By MRS:

- Rehabilitation strategies related to neural control of movement (including stroke, spinal cord injury, Parkinson's disease) and function (including carpal tunnel syndrome, repetitive stress injuries, low back pain) as well as strategies to prevent additional disabilities.

- Studies of gait and movement involving kinematics of movement and neural control of movement or function in altered states as compared to normal.

- Motor control in integrated limb function including studies of individuals with impairment or altered function compared to normal.

- Prostheses and orthotics, including neural prosthetics related to the musculoskeletal system.

- Robotic interventions to restore limb function.

- Biomechanics related to skeletal muscle activation and control in rehabilitation.

- Rehabilitative therapeutic interventions of the musculoskeletal system.

- Patient-oriented studies of rehabilitative medicine.

- Mechanisms of exercise in relation to disability.

- Use of traditional and alternative therapies in the treatment of physical impairments.

- SBIR/STTR studies relative to the physiological and bioengineering principles of rehabilitation medicine, assistive technologies and devices. These include gait analysis and human motion, monitoring of body external body movements and temperature, orthotics, prosthetic development and devices for motor function, wheelchairs and mobility aids, and exercise equipment..

Shared Interests Within the IRG:

- Skeletal Biology Development and Disease (SBDD) and Skeletal Biology Structure and Regeneration (SBSR): Clinical studies of bone fragility (osteoporosis) may be reviewed in SBDD. Studies of joint mechanics, or joint replacement, when the emphasis is internal to the tissue/body may be reviewed in SBSR. Investigations involving prosthetics or orthotics external to the body can be assigned to MRS. Similarly, studies of the repair of elements of the musculoskeletal system (using biomaterials, mechanical/cellular approaches, tissue engineering strategies), when the emphasis is internal to the tissue/body, can be reviewed in SBSR. Investigations related to the use or development of external devices/strategies for rehabilitation may be assigned to MRS.

- Skeletal Muscle Biology and Exercise Physiology (SMEP): Studies dealing with exercise and inactivity that focus on skeletal muscle growth and regeneration, contractile activity, or metabolism may be assigned to SMEP. Investigations of the use of exercise in rehabilitation that are concerned with multiple aspects of the musculoskeleton, can be assigned to MRS. Studies that focus on strategies to compensate for atrophied tissue using engineering or other less direct approaches, and studies to prevent disuse atrophy as a complication of existing disabilities, can be assigned to MRS.

Shared Interests Outside the IRG:

- Biology of Development and Aging (BDA) IRG: Studies of aging, disability and rehabilitation medicine are shared with BDA. Studies on musculoskeletal rehabilitation medicine involving interactions with age-related changes in other physiological systems could be assigned to BDA IRG when musculoskeletal function and rehabilitation are not the primary focus. This includes both studies of effects of age-related skeletal or muscle changes on other systems and effects of age-related changes in other systems on skeletal or muscle tissues. Studies of musculoskeletal tissue that are testing hypotheses about mechanisms of aging that affect multiple systems or non-muscle tissues could be assigned to BDA IRG. When musculoskeletal rehabilitation is the primary study focus, assignment may be to MRS.

- Health of the Population (HOP) IRG: Applications related to the socio-environmental influences, community-based interventions, nursing sciences, or nursing practice could be reviewed in the HOP IRG Investigations dealing with

the functional consequences of the intervention on physical well being (e.g., the effect of exercise on increased flexibility, or the effect of a prosthesis on greater mobility) may be evaluated in MRS.

- Risk, Prevention and Health Behavior (RPHB) IRG: Applications related to studies of behavioral approaches to, and consequences of rehabilitation interventions can be assigned to the RPHB IRG. Investigations of the functional consequences of the intervention on physical well being may be evaluated in MRS.

- Behavioral and Biobehavioral Processing (BBBP) IRG: BBBP IRG and MRS have mutual interests in motor control, problems of aging in the musculoskeletal system, and rehabilitative interventions. If the focus of the study is on altering the behavior of the individual, the application may be reviewed in the BBBP IRG. Neural control of movement and developmental motor issues (including cerebral palsy) could be reviewed in the BBBP IRG. Prevention and rehabilitation strategies related to development, learning, cognition, language and communication, and substance abuse may be evaluated in the BBBP IRG. These rehabilitation strategies may include occupational and/or physical therapy. If the focus of the rehabilitation strategy is to improve the physical well being of the individual, or if the emphasis is on the rehabilitation of muscle and/or orthopaedic function (e.g., in stroke, Parkinson's disease), the application may be reviewed by MRS.

- Surgical Sciences, Biomedical Imaging, and Bioengineering (SBIB) IRG: Studies of bioengineering and imaging are appropriate for MRS when the focus is physical rehabilitation. Studies on technology development could be assigned to the SBIB IRG.

- Brain Disorders and Clinical Neurosciences (BDCN) IRG: MRS and BDCN IRG have shared interests with respect to neuroprosthetic research on recovery and rehabilitation. MRS has broad expertise in physical therapy, physiology, and non-neuronal systems (specifically the musculoskeletal system), while the BDCN IRG has particular expertise in the neural basis of rehabilitation and recovery. As a consequence, studies related to rehabilitation of individuals with neural diseases that have an emphasis on the neural process may be assigned to the BDCN IRG. When the emphasis is on the rehabilitation of muscle and/or orthopaedic function (e.g., in stroke, Parkinson's disease), the application could be assigned to MRS.

Arthritis, Connective Tissue and Skin (ACTS) Study Section

The Arthritis, Connective Tissue and Skin Sciences (ACTS) Study Section reviews basic and clinical research applications dealing with the biology and diseases of joints, connective tissue, and skin.

Specific Areas Covered by ACTS:

Arthritis and Connective Tissue: This area includes inheritable, inflammatory and degenerative diseases of joints and connective tissues, such as systemic lupus erythematosus, rheumatoid arthritis, Sjogren's syndrome, osteoarthritis, scleroderma, psoriatic arthritis, spondyloarthropathies, vasculitides, polymyalgia rheumatica, fibromyalgia, palindromic arthritis, Lyme arthritis, septic arthritis, juvenile arthritis, polymyositis, dermatomyositis, crystal-induced diseases, and undifferentiated connective tissue diseases.

- Biology of the joint and connective tissue: structure and function of cartilage, bone, ligaments, tendons, synovium, extracellular matrix, capsule, joint fluid, blood vessels, innervation, articular cartilage, muscle, skin, immune system and other organs affected by rheumatic diseases.

- Pathogenesis of arthritis and related rheumatic diseases including: genetic influences, environmental factors, infectious agents, drugs, and other etiologic factors; mechanisms involving inflammatory cells and mediators, immune cells and mediators, tissue injury and degradation, regulation of tissue regeneration and repair, angiogenesis, and other cells including chondrocytes, fibroblasts, endothelial cells, smooth muscle cells, osteoclasts, osteoblasts, stem cells and synovial cells. These disease–related mechanisms include not only the joints but also all organs involved in systemic rheumatic diseases.

- Clinical research in arthritis and related rheumatic diseases: studies on natural history of disease; developmental therapeutics and interventions; genetic linkage studies; imaging, diagnostics, and biomarkers; pain, disability, physical rehabilitation, fatigue, and functional measures of clinical outcomes.

Skin and Cutaneous Biology. This area includes disorders of skin, such as inflammatory, pre-neoplastic, and hyperproliferative disorders, as well as systemic diseases with significant cutaneous involvement.

- Biology and physiology of the epidermis: role of keratinocytes, melanocytes, and Langerhans cells in barrier function, pigmentation, immune regulation, dermal-epidermal adhesion, and related functions, and the regulation of their growth, adhesion and differentiation.

- Biology and physiology of the dermis: synthesis, assembly, and degradation of the extracellular matrix of connective tissue and the dermo-epidermal basement membrane zone, angiogenesis, innervation, and inflammation.

- Biology and physiology of skin appendages: production of hair and nails, as well as development of hair follicles, sebaceous and eccrine glands.

- Development and homeostasis of skin and its appendages: epidermal and connective tissue stem cells; remodeling and repair of skin with maturation, during wound healing and in response to external stimuli; pre-neoplastic alterations of keratinocytes and melanocytes (including altered gene expression, cell-cell and cell-matrix interactions and immune processes that occur in the skin).

- Study of diseases of skin and its appendages, as well as systemic connective tissue diseases with skin involvement: study of the role of inflammation and the immune system in the disease process; perturbation in epidermal barrier function; diagnosis and therapy of skin diseases; development of novel treatment modalities, including gene therapy with skin as the effector organ.

- Genetic basis of the expression of the disease phenotype and susceptibility to skin and connective tissue disorders, and use of animal models, including transgenics.

- Studies of skin interactions with the environment: photoaging, UV sensitivity reactions; role of skin in transepidermal delivery of drugs; role of skin as a barrier against infectious, mechanical, and other toxic insults.

Shared Interests Within the IRG:

- Skeletal Biology Development and Disease (SBDD) and Skeletal Biology Structure and Regeneration (SBSR): Changes in articular cartilage (cells, matrix, and architecture) occur in the inflammatory arthridites (e.g. rheumatoid arthritis) as well as osteoarthritis. ACTS could review studies of arthritis focusing on systemic inflammatory processes. Applications that focus on abnormalities of matrix limited to bone and cartilage and associated tendon and ligament structures could be assigned to SBDD. Studies of cartilage degeneration and associated changes in bone and joints following joint injury and instability, or developmental disorders (e.g. DDH), as well as the study of articular cartilage in normal growth and development could be assigned to SBSR. Studies of injuries and their treatment for conditions, such as osteochrondritis dissecans and osteoarticular fractures, may be assigned to SBSR.

- Skeletal Muscle Biology and Exercise Physiology (SMEP): Studies of the clinical and immunological aspects of inflammatory muscle diseases may be assigned to ACTS whereas studies on muscle cell function could be assigned to SMEP.

Shared Interests Outside the IRG:

- Health of the Population (HOP) IRG and Risk, Prevention, and Health Behavior (RPHB) IRG: Behavior modification directed toward the prevention and treatment of arthritis and rheumatic diseases, including psychological aspects, could be assigned to the HOP IRG and RPHB IRG. Applications in which the primary outcome is evaluation of behavior are also appropriate for the HOP IRG. Population studies related to demographics may generally be assigned to the HOP IRG. Applications on the diseases, disorders, or functional consequences of behaviors could be assigned to ACTS.

- Immunology (IMM) IRG: The IMM IRG may be assigned applications concerning the etiology and pathogenesis of organ-specific and systemic autoimmune diseases. ACTS may be assigned applications on inflammatory and degenerative diseases of joints and connective tissues. ACTS is complementary to IMM IRG with respect to those applications requiring expertise in pathogenic effector mechanisms and specific factors or structures relevant to target organ

damage and repair. Similarly, IMM IRG is complementary to ACTS with respect to those applications requiring expertise in immunopathogenic mechanisms. Areas of unavoidable shared interest such as systemic lupus erythematosus and rheumatoid arthritis would be resolved according to the central focus of the application.

- Infectious Diseases and Microbiology (IDM) IRG: Studies that focus on the pathogen rather than the target tissue may be assigned to IDM IRG.

- Oncological Sciences (ONC) IRG: Studies of skin cancers and their clinical management could be assigned to the ONC IRG Studies of pre-neoplastic skin lesions and disorders could be assigned to ACTS.

- Endocrinology, Metabolism, Nutrition, and Reproductive Sciences (EMNR) IRG: Applications that focus upon nutrients, or general nutrition, may be assigned to the EMNR IRG. The effects of nutrients and other food components where connective tissue and skin may a part of the study may be assigned to the EMNR IRG as well. Basic, translational or clinical applications with a primary focus on connective tissue or skin, or arthritis, where nutrients or general nutrition may be a part of the study may be assigned to ACTS.

- Surgical Sciences, Biomedical Imaging, and Bioengineering (SBIB) IRG: Bioengineering studies of skin, cartilage and connective tissue as well as the development of artificial skin, cartilage and connective tissue may be assigned to ACTS, however, capability to review these topics also resides in the SBIB IRG. Studies of skin, cartilage and connective tissue which use biomedical imaging could be assigned to ACTS, but capability to review these topics also resides in the SBIB IRG. The development of a device, system, or analytical technique to advance biomedical imaging or a study in which a question about biomedical imaging is being addressed could be assigned to the SBIB IRG.